MEDICINE LAKE NATIONAL WILDLIFE REFUGE

MEDICINE LAKE, MONTANA

ANNUAL WATER MANAGEMENT PLAN

1981

UNITED STATES DEPARTMENT OF THE INTERIOR

FISH AND WILDLIFE SERVICE

MEDICINE LAKE NATIONAL WILDLIFE REFUGE

MEDICINE LAKE, MONTANA

ANNUAL WATER MANAGEMENT PLAN - 1981

I. Record of 1980 Water Use

A. Source of Supply

Run-off water received by the refuge from tributary streams was some of the lowest ever recorded. Only one other year in the last 20 years produced less and that was in 1977 when virtually no run-off was received. All water received by the refuge came from snow melt in March and April. No significant rainfall fell during the year until in September and then no run-off occurred.

B. Type of Rights

The U.S. Fish and Wildlife Service through filings posted and recorded hold appropriated water rights as shown in Table I. Also some of the older wells and watering ponds have vested groundwater rights. See Table I for a complete listing of water rights at Medicine Lake National Wildlife Refuge.

C. Purpose of Use

All appropriated creek waters were used for irrigation of lakes and marshes to produce wildlife food and habitat. Primary use is for the production and maintenance of waterfowl. Storage of water was for late season water needs and for the over wintering of fish and wildlife populations.

All wells and ponds were used for wildlife, livestock, and domestic purposes.

D. Season of Use

The main season of water use is generally from mid-March until the first part of December. Water supplies are especially important from mid-March to late July for waterfowl pairing and brooding. Another important time period is from mid-September to mid-November for migrating waterfowl. The water impoundments are usually frozen over from early December through the end of March every year. The winter season use is necessary to carry over resident fish and wildlife populations.

The wells and ponds are generally in use by wildlife and livestock from mid-March thru the first part of December and the Headquarters well is used year round for domestic purposes.

TABLE I. WATER RIGHTS OF THE MEDICINE LAKE NATIONAL WILDLIF REFUGE

WATER RIGHTS FILING NUMBER	SOURCE	AMOUNT OF WATER RIGHT	ACRES UNDER WATER RIGHTS AND STORAGE RIGHTS
233163	Cottonwood Creek	100 cfs	3640
233164	Sand Creek	75 cfs	3640
233165	Lost Creek	25 cfs	840
233166	Sheep Creek	20 cfs	750
242886	Sheep Creek	300 cfs	2287
233167	Lake Creek	100 cfs	3640 and 3200 A/F storage
233168	Big Muddy Creek	50 cfs	1600
233169	Big Muddy Creek	1200 cfs	2000 and 55,000 A/F storage
Vested groundwater	Sandhills Well #1	3 gpm	
Appropriated groundwater - no number	Sandhills Well #2	3 gpm	
Vested groundwater	Headquarters Well	300 gpm	
Appropriated groundwater - no number	Headquarters Well	25 gpm	
373059	Headquarters Well	25 gpm	
Vested groundwater	Stock Watering Pond #3	5 gpm	
Vested groundwater	Stock Watering Pond #4	5 gpm	
Vested groundwater	Stock Watering Pond #5	5 gpm	
Vested groundwater	#2 Reed's Pond	10 gpm	
Vested groundwater	#1 Merganser Pond	10 gpm	

probably needed reference

E. Quantity Used

A total of 2,476.7 acre feet of water entered the refuge via creek channels during the 1980 spring run-off period. No other run-off water was received during the year. Of the total amount received, 775 acre feet were diverted into the Homestead Unit via the Indian Service Dam from the Big Muddy Creek and 1,701.7 acre feet entered the main portion of the refuge from Big Muddy Creek, Sand Creek, Cottonwood Creek, and Lake Creek. All of the water received was utilized in refuge impoundments. Total water used by the refuge during the year was 19,101.9 acre feet. Total water use was lost to evaporation and groundwater seepage.

An estimated fifteen acre feet of water was pumped from four refuge wells. No data is available on the amount of water used in the watering ponds.

F. Place of Use

TABLE II shows the water deficiency of each impoundment before run-off in 1980 and the tributaries on which the refuge has water rights that fill these impoundments.

TABLE II. Major Impoundment Water Deficiencies - 1980

AREA	Deficiency in Acre Feet	Tributary Stream
Homestead Lake	2,028	Big Muddy Creek Lost Creek Sheep Creek
Gaffney Lake	547	Cottonwood Creek Lake Creek Sand Creek
#10 Lake	23	Cottonwood Creek Lake Creek Sand Creek
Deep Lake	34	Cottonwood Creek Lake Creek Sand Creek
Long Lake	76	Cottonwood Creek Lake Creek Sand Creek
#11 Lake	288	Cottonwood Creek Lake Creek Sand Creek
#12 Lake	620	Lake Creek
Katy's Lake	335	Lake Creek
Medicine Lake	11,921	Big Muddy Creek
TOTAL DEFICIENCY	15,872 Acre Feet	

G. Adequacy of Supply

Only three impoundments reached operational capacity during spring run-off - these were #12 Lake, #10 Lake, and Deep Lake.

The following table shows the amount of water received from each tributary stream during 1980.

TABLE III. Water Received Per Tributary Stream - 1980

Big Muddy Creek	1563.0 Acre Feet
Lost Creek	0 Acre Feet
Sheep Creek	.5 Acre Feet
Sand Creek	286.5 Acre Feet
Cottonwood Creek	48.1 Acre Feet
Lake Creek	578.6 Acre Feet

Precipitation during the first part of the year was very short. The snow that did fall went mainly into the ground as it melted. The soil was dry and there was very little if any frost in most upland areas.

Rainfall during the spring period was extremely short until the month of June when near normal rainfall fell. The month of July was very dry but August was above average as was September. These rains, although beneficial, did little to relieve our water shortage or add to ground-water supplies.

TABLE IV. Annual Precipitation Amounts (Inches)

	1980		1979		
Month	Total Precip.	Snowfall	Total Precip.	Snowfall	Normal Precipitation
January	.47	5.75	.17	3.0	.43
February	.10	1.0	.98	15.0	.39
March	.34	3.0	.30	3.0	.37
April	.33		2.38	20.75	1.24
May	.56		1.91		2.04
June	3.22		.84		3.45
July	.69		1.60		2.12
August	3.37		.19		1.68
September	1.49		.77		1.17
October	.91	5.0	.25		.71
November	.31	3.0	.11	3.0	.51
December	.46	6.0	.06		.33
TOTALS	12.25	23.75	9.56	44.75	14.44

TABLE V. MONTHLY RECORD OF GUAGE READINGS - 1980

IMPOUNDMENT	Homestead Lake	Gaffney's Lake	#10 Lake	Deep Lake	Long Lake	#11 Lake	#12 Lake	Katy's Lake	Medicine Lake
OPERATIONAL LEVEL	1935.90	1945.10	1945.80	1946.20	1945.10	1953.00	1956.00	1954.00	1943.02
JANUARY	1934.72	*	1944.72	*	*	1951.02	1954.26	1953.34	1941.60
FEBRUARY	1934.72	*	1944.72	*	*	1951.02	1954.26	1953.34	1941.60
MARCH	1934.72	*	1944.72	*	*	1951.02	1954.26	1953.34	1941.84
APRIL	1935.40	1943.14	1945.74	1945.58	1943.16	1951.95	1955.66	1953.16	1942.04
MAY	1934.96	1943.08	1945.44	1945.10	1943.08	1951.66	1955.92	1952.88	1941.70
JUNE	*	1942.38	1945.12	1944.46	1942.38	1951.40	1955.62	1952.56	1941.30
JULY	1933.90	1941.80	1944.64	1943.80	1941.80	1951.02	1954.94	1952.26	1940.96
AUGUST	1933.10	1941.65	1944.36	1942.60	1941.20	1950.84	1954.48	*	1940.60
SEPTEMBER	*	*	1944.40	*	*	*	1954.24	1951.78	1940.44
OCTOBER	1932.40	1941.40	*	1942.15	1941.00	1950.88	1954.30	1951.88	1940.28
NOVEMBER	1932.40	1941.31	1944.80	1942.15	1940.90	1950.88	1954.40	1951.88	1940.28
DECEMBER	1932.40	1941.31	1944.80	1942.15	1940.90	1950.88	1954.48	1951.88	1940.28

* Not available.

All readings are for the middle of the month.

All operational levels were reset with new water gauges and recalculated at correct MSL readings.

TABLE VI. Comparison of Water Deficiencies* - Acre Feet Needed

IMPOUNDMENT	1981	1980	1979	1978	1977	1976	1975	1974
Homestead Lake	4298	2028	4199	2648	2002	1589	2648	4457
Gaffney Lake	2442	547	214	842	641	**	427	427
#10 Lake	266	23	23	97	131	**	89	109
Deep Lake	403	34	23	57	52	**	52	69
Long Lake	291	76	30	149	89	**	89	89
#11 Lake	405	288	174	462	307	250	386	318
#12 Lake	729	620	286	1324	968	1785	991	916
Katy's Lake	661	334	183	339	484	325	588	688
Medicine Lake	23002	11921	5205	19980	9738	3862	11249	15279
TOTALS	32497	15871	10337	25898	14412	7811	16519	22252

* Deficiencies are based on water elevations on January 1 of each year

** At or above operation level.

H. Improvements to Water Facilities During 1980.

Major improvements during the year included the resetting of gauges on all impoundments. Many of our impoundments never had a guage or if it did have one it had become inaccurate over the years. All of the impoundments now have new gauges which have been set at accurate MSL levels and the operational levels have been recalculated to match these changes.

The other major improvement was the completion of a construction contract on the Diversion structure. The contract called for an additional four feet of height to be added to the exsisting structure. The old structure was 18" lower than the spillway on the main #1 dam. With this difference, we were unable to by-pass silt laden water down the Big Muddy Creek. Now that the structure is complete, we will be able to by-pass the more heavily silt laden waters which are usually associated with summer thunder storms.

II. Recommendations for 1981

The refuge will need 32,497 acre feet of water in the spring of 1981 to bring all impoundments to operational level. Normal average spring flows are twice this amount but barring extremely heavy precipitation we will fall way short of our needs. As of this writing (late March), all snowpack has disappeared and prolonged drought conditions persist.

The following recommendations are being made for water management on Medicine Lake National Wildlife Refuge during 1981.

1. All impoundments should be filled to operational level as early as possible.

2. Water that enters the refuge from the east end via Lake Creek, Sand Creek, and Cottonwood Creek should be utilized in filling the upper impoundments to operation level before any is released into the main lake.

3. Continue water chemistry readings, i.e. salinity and conductivity on all impoundments, on all inflows, and on all discharges.

4. Homestead Lake has a high botulism potential. In past years, it has been necessary to drawdown this lake to help combat the disease. If the disease breaks out again, we recommend the unit be drawn down to its lowest level. This elevation will dewater the southern third of the lake and will pull all of the water out of the bullrush. We also recommend that the lake be refilled after the botulism danger no longer exists. The lake can be refilled in the fall by releasing water from Medicine Lake.

5. If spring run-off is going to be inadequate to fill both Medicine Lake and Homestead Lake, we recommend by-passing water through the #4 structure on Medicine Lake to fill Homestead Lake within at least one foot of operational level. This water level in Homestead Lake will make most water areas available to pairing and nesting waterfowl. It would take a release of approximately 3,000 acre feet of water to bring the Homestead Lake to a level one foot below operational level. This flow could be by-passed to the Homestead Unit by closing the diversion structure and routing it through the #1 dam. It is however easier and more efficient to run the water into Medicine Lake and out of the #4 structure.

6. Hold water as high as possible in Medicine Lake (except for above noted recommendations) to accomplish several refuge objectives, These objectives are:

   A. Increase waterfowl production by providing more available pair area.

   B. Provide maximum nesting habitat for grebes and other marsh nesting birds.

   C. Provide spawning habitat for northern pike. This assures a good population of northerns to help naturally control carp and also it provides for additional recreation visits.

   D. Insure adequate water levels for over wintering resident fish and wildlife populations.

7. Water in excess of what is needed to obtain approved operational levels will be diverted or released downstream to the next impoundment. Excess water in Medicine Lake or Homestead Lake will be released back into the Muddy Creek drainage.

8. Now that construction work is completed on the diversion structure, every effort should be made to keep silt laden waters in the Big Muddy Creek from entering the refuge. These high silt loads generally occur as a result of heavy summer rains. We do recommend this year however, that all waters should be diverted into the lake because of extremely low water levels. When the lake is at operational level the diversion structure should be closed during heavy silt load flows and the water should be by-passed down the Big Muddy Creek through the #1 dam and then through the Indian Service Dam at the Homestead Unit.

9. Proposed Water Use Priority

Unit	Purpose	Priority
#12 Lake	Nesting and brooding, storage, fish rearing	2
Katy's Lake	Nesting and brooding	1
#11 Lake	Nesting and brooding	1
#10 Lake	Nesting and brooding	1
Gaffney Lake	Nesting and brooding	1
Deep Lake	Nesting and brooding	1
Long Lake	Nesting and brooding	2
Medicine Lake	Nesting and brooding, storage, fish rearing	2
Homestead Lake	Nesting and brooding	1

TABLE VII. 1980 Water Deficiency

	Elevation 01/01/80	Operating ** Elevation	Elevation Difference	Acre Feet Needed	Surface Acres At Oper. Level
Homestead Lake	1936.28	1937.85	1.57	2028.28	1291.9
Gaffney Lake	1943.22*	1944.50*	1.28	547.07	427.4
#10 Lake	1944.72	1945.00	.28	23.3	83.2
Deep Lake	1944.00*	1945.00*	1.00	34.4	34.4
Long Lake	1943.22*	1944.50*	1.28	76.29	59.6
#11 Lake	1951.02	1952.54	1.52	287.58	189.2
#12 Lake	1954.26	1955.93	1.67	619.57	371.
Katy's Lake	1954.52	1956.0	1.48	334.48	226
Medicine Lake	1941.60	1943.02	1.42	11920.62	8394.8
Total				15871.59	

* Estimated

** Old Water elevation readings.

1980 Resume

MEDICINE LAKE NATIONAL WILDLIFE REFUGE

1980 Water Flow Data and Water Deficiency

Water deficiency in acre feet on January 1, 1980 - 15,872

Total water flow in acre feet received by the refuge - 2476.7

Spring flow - 2476.7

Summer flow - negligible

Excess water in acre feet diverted from the refuge - none

Spring flow - none

Homestead drawdown - none

Water diverted from Medicine Lake to Homestead Lake - 775 A/F

Water deficiency in acre feet on December 31, 1980 - 32,497

Total water in acre feet utilized by the refuge - 19,102 A/F

All of this water was lost to natural processes, i,e. evaporation and seepage to groundwater. Of the total utilized, 16,625 A/F were used from existing supplies and 2,477 A/F were used from spring run-off.

1980 Water Flows Received By Tributary

Big Muddy Creek	1563 acre feet
Lost Creek	0
Sheep Creek	.5 acre feet
Sand Creek	286.5 acre feet
Cottonwood Creek	48.1 acre feet
Lake Creek	578.6 acre feet

TABLE VIII Water Chemistry Readings on Tributary Streams

STREAM	Date	Temp. °C	Salinity Parts/1000	Conductivity Micromho/cent.	Comments
Lake Creek	4/2/80	1	.1	480	Taken at Buster's Crossing
Sand Creek	3/27/80	2	.8	900	Taken at Lake Grade Culvert
Sand Creek	5/2/80	3	.2	650	Taken at Lake Grade Culvert
Muddy Creek	3/27/80	1	2.0	2180	Taken at Diversion structure
Muddy Creek	3/27/80	3	1.9	2180	Taken at Indian Service Dam
Muddy Creek	4/2/80	1	.2	580	Taken at Diversion structure
Muddy Creek	12/17/80	.5	2.0	2200	Taken at Diversion structure

TABLE IX Water Chemistry Readings on Impoundments - * Spring

IMPOUNDMENT	Location	Temp. °C	Salinity Parts/1000	Conductivity Micromho/cent.	Comments
Medicine Lake	1 A	5.6	1.1	1510	Taken @ Bruce's Is. narrows.
Medicine Lake	1 B	4.5	1.1	1550	Taken 50 yds. out from 9F
Gaffney Lake	2 A	5.0	1.2	1680	Taken 100 yds. out from end of outlet.
Gaffney Lake	2 B	5.0	1.2	1700	Taken 100 yds. out from end of island canal.
#10 Lake	3	2.1	2.9	3100	Taken 100 yds. out from end of outlet on Gaffney
Deep Lake	4	4.9	2.5	2920	Taken 100 ft. out from north bank
#12 Lake	5	4.0	1.2	1600	Taken 100 ft. above #12 dam
Katy's Lake	6	not taken			
#11 Lake	7	not taken			
Homestead Lake	8A, 8B	not taken			

* Readings taken before run-off - March 20, 1980

TABLE X Water Chemistry Readings on Impoundments - Fall*

IMPOUNDMENT	Location	Temp. °C	Salinity Parts/1000	Conductivity Micromho/cent.	Comments
Medicine Lake	1 A	.5	1.5	1600	
Medicine Lake	1 B	0	1.1	1540	
Gaffney Lake	2 A	-.2	1.5	1800	
Gaffney Lake	2 B	0	1.5	1850	
#10 Lake	3	1	2.5	2650	
Deep Lake	4	1	2.7	2870	
#12 Lake	5	1.5	1.0	1300	
Katy's Lake	6	0	6.0	6000	
#11 Lake	7	.5	3.0	3320	Taken 100' below #12 dam
Homestead Lake	8 A	1	4.5	4650	Taken in canal between north lakes
Homestead Lake	8 B	.7	8.0	7000	Taken 100 yds.into Lost Creek Bay

* Taken December 17, 1980 through 6" of ice.